2016 Children's Safe Products - Reporting Rule update
Draft Chemical Evaluation

CAS 38051-10-4

Substance Name Phosphoric acid, P,P'-[2,2-bis(chloromethyl)-1,3-propanediyl] P,P,P',P'-tetrakis(2-chloroethyl) ester (**V6**)

Toxicity

EPA classified V6 a moderate hazard for carcinogenicity based on the toxicity of chemicals with very similar structures [1]. Commercial V6 also contains 4.5 – 13.5% Tris (2-chloroethyl) phosphate (TCEP) as an impurity [1, 2]. TCEP is classified as a carcinogen by the State of California [3] and a 1b reproductive hazard by the European Union [4].

EPA considered V6 to have high hazard for developmental toxicity and moderate hazard for reproductive toxicity [1]. In a two-generation oral rat study, doses of 86 mg/kg-day caused thyroid effects (follicular hypertrophy and increased organ weight) in the parental generation and caused retarded fetal and pup growth in offspring [5]. The no-observed-adverse-effect-level (NOAEL) was 29 mg/kg-day.

Exposure

V6 has been used as an additive flame retardant in polyurethane foam and has been identified in a number of consumer products including foam carpet pads, tent fabric, and baby products [2, 6, 7]. Average concentration in the products that tested positive was 4.6% by weight of the foam [6]. It is reportedly used in interior foam for automotive and furniture foam at typical loadings of ~6% w/w [5]. U.S. national production volume of V6 was between 500,000 and 1 million pounds in 2002 but more current information is withheld as confidential business information [8].

V6 has not been widely studied in house dust or the environment. It was detected in 95% of car dust samples and 75% of house dust samples in a single Boston area study [2]. Concentrations in car dust were significantly higher than the house dust which is consistent with its reported higher use in automobile foam. Median levels in car dust were 103 ng/g.

We did not identify any biomonitoring studies for V6. The compound is readily absorbed across the gut and less readily across skin. Half-life for elimination from the body was 99-113 hours in orally exposed rats [1].

References

1. EPA, *Flame Retardants Used in Flexible Polyurethane Foam: An Alternatives Assessment Update*. 2015, U.S. Environmental Protection Agency.
2. Fang, M., et al., *Investigating a novel flame retardant known as V6: measurements in baby products, house dust, and car dust.* Environ Sci Technol, 2013. **47**(9): p. 4449-54.
3. California, S.o. *Chemicals Known to the State to Cause Cancer or Reproductive Toxicity*. 2016 [cited 2016 August]; Available from: http://oehha.ca.gov/proposition-65/proposition-65-list.

4. ECHA, *Brief Profiles: Tris(2-chloroethyl) phosphate*. [accessed September 2016]. Available at https://echa.europa.eu/information-on-chemicals.
5. ECHA, *2,2-bis(chloromethyl) trimethylene bis[bis(2-chloroethyl) phosphate] (V6) - Summary Risk Assessment Report*. 2008, European Union: Ireland and United Kingdom.
6. Stapleton, H.M., et al., *Identification of flame retardants in polyurethane foam collected from baby products.* Environ Sci Technol, 2011. **45**(12): p. 5323-31.
7. Ecology, *Flame Retardants in General Consumer and Children's Products*. Washington State Department of Ecology, June 2014, Publication No. 14-04-021.
8. EPA. *Chemical Data Access Tool (CDAT) - Chemical Data Reporting (CDR) information on the production and use of chemicals manufactured or imported into the United States*. 2012 10/15/2015 10/30/2015]; Available from: http://java.epa.gov/oppt_chemical_search/.